

## Claims

1. A Viterbi decoder including an Add-Compare-Select unit having a butterfly unit (300) comprising:
  - 5 first adder means (310) for receiving a first path metric and a branch metric and for producing at its output the addition thereof;
  - second adder means (320) for receiving a second path metric and said branch metric and for producing at its output the addition thereof;
  - 10 first comparator means (330) coupled to receive the output of the second adder means and coupled to receive the first path metric for comparing therebetween;
  - second comparator means (340) coupled to receive the output of the first adder means and coupled to receive the first path metric for comparing therebetween;
  - 15 first selection means (350) for selecting between the second adder means output and the first path metric to produce a first survivor path metric in dependence on the first comparator means comparison; and
  - 20 second selection means (360) for selecting between the first adder means output and the second path metric signal to produce a second survivor path metric in dependence on the second comparator means comparison,
  - 25 for processing metric transitions where a second branch metric is zero.

2. The Viterbi decoder of claim 1 wherein the Add-Compare-Select unit further comprises a butterfly unit (300) having:

first, second, third and fourth adder means for receiving a first metric, a second metric, a first branch metric and a second branch metric;

first comparison means for comparing outputs of the first and second adder means;

second comparison means for comparing outputs of the third and fourth adder means;

first selection means for selecting between the outputs of the first and second adder means in dependence on the comparison of the first comparison means to produce a first survivor path metric; and

second selection means for selecting between the outputs of the third and fourth adder means in dependence on the comparison of the first comparison means to produce a second survivor path metric.

3. The Viterbi decoder of claim 1 adapted for code rates of the type  $R = k/m$ , where  $k > 1$ , and  $k$  and  $m$  are integers.

4. A method of producing metrics for use in a Viterbi decoder comprising selecting metrics such that for at least some trellis transitions a branch metric is zero, whereby a simplified Add-Compare-Select butterfly unit may be used.

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5. The method of claim 4 wherein the metrics are selected by subtracting from each of a predetermined set of metrics a chosen one thereof to produce a resultant set of metrics having at least one zero value.

- 10 6. The method of claim 4 further comprising re-adjusting the dynamic range of the selected metrics by multiplying each of the selected metrics by a scaling factor if the following property is satisfied:

$$m_a(\text{bit} = 0) = -m_a(\text{bit} = 1) \forall a$$

- 15 7. The method of claim 6 adapted for OFDM coding.

8. The method of claim 6 further comprising adapting the selected metrics to additive noise.

- 20 9. The method of claim 7 wherein the additive noise comprises coloured noise.

10. The method of claim 4 adapted for code rates of the type  $R = k/m$ , where  $k > 1$ , and  $k$  and  $m$  are integers.

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11. A butterfly unit for use in a Viterbi decoder Add-Compare-Select unit, the butterfly unit (300) comprising:

first adder means (310) for receiving a first path metric and a branch metric and for producing at its output the addition thereof;

second adder means (320) for receiving a second path metric and said branch metric and for producing at its output the addition thereof;

first comparator means (330) coupled to receive the output of the second adder means and coupled to receive the first path metric for comparing therebetween;

second comparator means (340) coupled to receive the output of the first adder means and coupled to receive the first path metric for comparing therebetween;

first selection means (350) for selecting between the second adder means output and the first path metric to produce a first survivor path metric in dependence on the first comparator means comparison; and

second selection means (360) for selecting between the first adder means output and the second path metric signal to produce a second survivor path metric in dependence on the second comparator means comparison.

12. The butterfly unit of claim 11 adapted for code rates of the type  $R = k/m$ , where  $k > 1$ , and  $k$  and  $m$  are integers.